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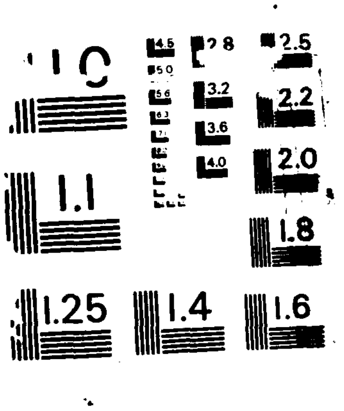

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AD-A191 658

# ARMED SERVICES VOCATIONAL APTITUDE BATTERY (ASVAB): ALTERNATE FORMS RELIABILITY (FORMS 8, 9, 10, AND 11)

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Malcolm James Ree
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This project investigated the alternate forms reliability of the Armed Services Vocational Aptitude Battery (ASVAB) Forms 8, 9, 10, and 11. High internal consistency reliability coefficients had been previously obtained and reported; however, coefficients of equivalence had not been studied. The direct calculation of parallel forms reliability was precluded; therefore, the alternate forms reliability coefficients of Form 11a with Forms 9a, 9b, 10a, and 10b were calculated. Then the alternate forms reliability coefficients of Form 8a with Forms 9a, 9b, 10a, and 10b were calculated. Alternate forms reliability of Form 11a with Form 8a was inferred. High reliability coefficients were expected, and this expectation was substantiated. [illegible]

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Chief, Force Acquisition Branch

This publication is primarily a working paper. It is published solely to document work performed.

# SUMMARY

The Armed Services Vocational Aptitude Battery (ASVAB) is periodically updated in order to ensure test security and to make psychometric improvements. ASVAB Forms 8, 9, and 10 were operational from October 1980 to October 1984. High internal consistency reliability coefficients were obtained and reported for these operational forms; however, alternate forms reliability, which indicates equivalence, had not been investigated.

ASVAB Forms 11a, 11b, 12a, 12b, 13a, and 13b were developed to replace Forms 9a, 9b, 10a, and 10b in operational use. From among Forms 11, 12, and 13, Form 11a was identified as having the most "central" distributions and descriptive statistics. Therefore, Form 11a was selected for the initial calibration of the new forms. Portions of Forms 11a and 8a were administered to service applicants at the Military Entrance Processing Stations (MEPS). Subjects were assigned randomly to Form 11a or Form 8a. Thus, Form 11a could not be correlated with Form 8a, but each of these forms could be correlated with Forms 9a, 9b, 10a, and 10b, which were being administered operationally at the MEPS. The present effort examined the alternate forms reliability of ASVAB Forms 8a, 9a through 10b, and 11a.

The alternate forms reliability coefficients of Forms 9a, 9b, 10a, and 10b with Form 11a were calculated. The alternate forms reliability coefficients also were calculated for Forms 9a, 9b, 10a, and 10b with Form 8a. These reliability correlations were computed for the total sample, gender subgroups, and race/ethnic subgroups. Alternate forms reliability of Form 11a with Form 8a was inferred from these computed reliabilities.

ASVAB Forms 9a through 10b and 11a were developed to be content parallel to ASVAB Form 8a; therefore, high coefficients of equivalence were expected. This expectation was substantiated, and the reliability coefficients were within acceptable ranges for all subgroups of interest.

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# ARMED SERVICES VOCATIONAL APTITUDE BATTERY (ASVAB): ALTERNATE FORMS RELIABILITY (FORMS 8, 9, 10, AND 11)

## I. INTRODUCTION

The Air Force Human Resources Laboratory is the lead laboratory for research and development in support of the Armed Services Vocational Aptitude Battery (ASVAB). The ASVAB is used for selection and classification of enlistees into the four branches of the armed services. ASVAB consists of 10 subtests--eight power subtests and two speeded subtests. In order of administration, the power subtests are: General Science (GS), Arithmetic Reasoning (AR), Word Knowledge (WK), Paragraph Comprehension (PC), Auto and Shop Information (AS), Mathematics Knowledge (MK), Mechanical Comprehension (MC), and Electronics Information (EI). The speeded subtests are Numerical Operations (NO) and Coding Speed (CS), which are the fifth and sixth subtests in the battery. Descriptions of the 10 subtests are presented in Appendix A. Each of the armed services uses its own composites of the subtests to select and classify applicants. The Air Force's composites are listed in Appendix A.

In 1980, the National Opinion Research Center administered ASVAB Form 8a to a sample of male and female American youth; the sample was nationally representative. This effort produced a new normative score scale for the ASVAB that could be used for selection and classification of armed service applicants. ASVAB Form 8a, thus, became the reference test to which all subsequent ASVAB test versions are calibrated (Maier & Sims, 1982).

The ASVAB is periodically revised to minimize test compromise, replace obsolete items, and make improvements based on recent research findings concerning validity or psychometric techniques. ASVAB Forms 9 and 10 were operational from October 1980 to October 1984.

High internal consistency reliability coefficients (ranging from .80 to .93) of ASVAB Forms 8, 9, 10, and 11 have been reported elsewhere (see Prestwood, Vale, Massey, & Welsh, 1985; Ree, Mullins, Mathews, & Massey, 1982). While internal consistency reliability indicates the degree to which the items within a subtest measure the same construct (or factor), this type of reliability does not indicate the equivalence across different test forms measuring the same construct. Another type of reliability which produces coefficients of equivalence is alternate forms reliability. The alternate forms reliability of Forms 9a through 10b, with 8a and with 11a, has not been previously investigated.

The purpose of this effort was to determine the alternate forms reliability of ASVAB Forms 9a, 9b, 10a, 10b (test versions which were operational at the time of data collection) with ASVAB Form 8a (the normative reference test). In addition, this effort investigated the alternate forms reliability of Forms 9a through 10b with ASVAB 11a (a candidate form of ASVAB not yet in operational use at the time of data collection). Parallel forms require that the tests measure the same content area, and have equal means, variances, and correlations with an external criterion. This last requirement also implies equal shape of both observed and true score distributions. Alternate forms reliability usually applies to a more relaxed set of standards requiring equivalent content and similar correlations with external criteria but not necessarily equal means and variances of observed test scores. For theoretical and practical reasons, the alternate forms reliabilities are to be preferred, although internal consistency reliabilities also provide useful information about the interchangeability of test scores.

ASVAB Form 11a was one of six parallel tests (ASVAB Forms 11a, 11b, 12a, 12b, 13a, and 13b) to be calibrated during January through March 1983, as replacements for ASVAB Forms 9a, 9b, 10a, and 10b. These six tests had been administered at several Recruit Testing Centers (RTCs) representing all the services. Form 11a was found to be the most central of the six tests during the

RTC testing phase. In this case, "most central" indicates that the means and variances of Form 11 are closest to the average of all six forms. For that reason, it was chosen for use in initial calibration of the new forms. Refinements in the calibration across forms would be based on a later Initial Operational Test and Evaluation (IOT&E). ASVAB Form 11a was calibrated from data collected from service applicants at the Military Entrance Processing Stations (MEPS) and their satellite Mobile Examining Team Sites (METS). At that time, all applicants were administered ASVAB Form 9a, 9b, 10a, or 10b for enlistment qualification. A random half of the applicants were also administered one of several portions of ASVAB Form 11a; the other half were administered one of several portions of the calibration reference test (ASVAB Form 8a). Thus, the nature of the data collection design precluded a direct calculation of a reliability coefficient between Forms 8a and 11a because the forms were administered to different but randomly equivalent samples. However, the alternate forms reliability coefficients of Forms 9a, 9b, 10a, and 10b with Form 11a were calculated. The reliability coefficients also were calculated for Forms 9a, 9b, 10a, and 10b with Form 8a. These reliability coefficients were compared for the total sample, gender subgroups, and race/ethnicity subgroups. Based on these comparisons, inferences were made concerning the alternate forms reliability of Form 11a with Form 8a.

The reliability coefficients computed for Form 8a and Forms 9 and 10 are between parallel tests (Gulliksen, 1950, p. 133), whereas the reliability estimates between Form 11a and Forms 9 and 10 are alternate forms reliability.

## II. METHOD

### Subjects

The sample of interest consisted of 75,000 armed service applicants who were administered ASVAB Form 9a, 9b, 10a, or 10b for enlistment qualification at the MEPS and their geographically dispersed satellite testing sites in January through February 1983.

### Test Administration

The data for these analyses were collected during a study to equate ASVAB Forms 11, 12, and 13 to ASVAB Form 8a. Nine partial batteries (due to time constraints, only portions of the battery could be administered) were constructed from the experimental ASVAB Form 11a; and nine similarly constructed partial batteries were developed from the reference Form 8a. Appendix B (Tables B-1 and B-2) shows the composition of the MEPS test booklets. A technical report by Ree, Welsh, Wegner, and Earles (1985) contains details of the study.

Each of the individual subtests and each of the score composites used by the various armed services for selection and classification were represented in at least one partial battery. Sixty-four MEPS, located in various regions throughout the United States, participated in the study. Each MEPS received an equal number of each of the 18 partial batteries (nine partial 11a forms and nine partial 8a forms) and was responsible for distribution of the forms to their satellite METS and Office of Personnel Management (OPM) sites. Test booklets were distributed randomly to subjects at each testing session to achieve an equivalent groups design. Another report (Ree et al., 1982) details the exact methods. All tests were administered under operational conditions and with the informed consent of the subjects.

### Data Editing

Form-Number Verification. In any investigation of this sort, some examinees will indicate the wrong booklet or form number on their answer sheets. To verify form numbers, subjects with

scores at or below the chance level were rescored with each of the other form answer keys; if a score obtained with another answer key exceeded the score of the indicated form number key, the score from the higher scoring key was adopted and the form designation was corrected for continued analyses. If no other key produced higher scores, the form number was retained and data were retained for additional editing and processing.

Elimination of Suspect Cases. Case records were eliminated if: (a) fewer than one-third of the items were marked in any subtest, (b) unlikely response strings (AAAA...) or systematic patterning (ABCABC...) occurred, or (c) the raw scores on a given subtest deviated more than ± 2.5 standardized residual units from predicted raw scores calculated from all other subtests (for details see Prestwood et al., 1985).

Estimation of Reliability. Reliability coefficients were calculated as correlations between Form 8a and each of the four tests (9a through 10b) for the total sample. Subtest and Armed Forces Qualification Test (AFQT) reliabilities were estimated from raw scores, whereas composite reliabilities were estimated from standard scores (Ree et al., 1985). In addition, reliability coefficients were calculated for each subgroup of interest (gender and race). These same analyses were conducted for the group who completed the 11a partial test batteries.

# III. RESULTS

## Results of Editing

Approximately 84% of the total number (n = 75,000) of cases generated from the MEPS and OPM sites were included in the data analysis. The sample actually analyzed contained 62,938 cases. After data editing, the sample consisted of 83% males (n = 52,031) and 17% females (n = 10,907). The racial/ethnic subgroups analyzed and their representations were: White, 68% (n = 43,010); Black, 23% (n = 14,670); and Hispanic, 5% (n = 2,927). Four percent of the total sample was not included in these three ethnic groups due to their failure to indicate ethnicity or multiple marking of ethnicity on answer sheets. Appendix B (Table B-3) describes the sample remaining after data editing.

## Total Sample Reliability Coefficients

Reliability coefficients were calculated as correlations between ASVAB Form 8a test scores and the like-named subtest scores on Forms 9a, 9b, 10a, and 10b (reliabilities were computed for both subtests and composites). These reliability coefficients are presented in Appendix C. Inspection of Tables C-1 and C-2 indicates that, for each subtest, reliability coefficients across parallel forms are similar. For example, the reliability coefficients for the General Science (GS) subtest are .79 (8a vs. 9a) and .80 (8a vs. 9b, 10a, & 10b). This is to be expected as GS in Forms 9a and 9b consists of the same items presented in a different order. The same is true for Forms 10a and 10b. In all versions, a or b, the non-AFQT items are identical but are arranged in a different order in the subtest. Table A-2 lists those subtests which contain AFQT items.

Across all parallel forms, the reliability coefficients ranged from a low of .67 on Paragraph Comprehension (8a vs. 9a and 9b) to a high of .88 on Word Knowledge (8a vs. 9a). As expected, the shortest subtest, Paragraph Comprehension (PC), had the lowest reliability, whereas longer tests such as Word Knowledge (WK) were the highest in estimated reliability. This is consistent with theory and practice.

Also as expected, the parallel forms reliability coefficients for the Air Force composites and the AFQT were higher than for most individual subtests. Composite coefficients ranged from .87 to .93. As was the case with the subtests, each separate composite's reliability coefficients were similar across forms.

In like manner, when alternate forms reliability coefficients were calculated for Forms 9b, 10a, and 10b against like-named ASVAB Form 11a subtest scores, similar results were found. These reliability coefficients are tabulated in Appendix C. Tables C-3 and C-4 show that for each subtest, the reliability coefficients across forms were not substantially different. The greatest across-forms variation in coefficients was found for the Paragraph Comprehension subtest, where coefficients ranged from .68 (11a vs. 9b) to .75 (11a vs. 10a). This is the least reliable of all the subtests. Across all forms and subtests, the reliability coefficients ranged from .68 to .89. Again, for each specific composite, reliability coefficients were stable across forms. The composite coefficients ranged from .86 to .94.

## Subgroup Reliability Coefficients

Since there was little variation across forms in the total sample's reliability coefficients for the like-named composites, population subgroup reliability coefficients were computed with the four test forms (9a through 10b) combined into a single sample. That is, alternate forms reliability coefficients were calculated by correlating scores on Form 8a with like-named scores on all production test forms, without regard to the production test form designation. Similarly, alternate forms reliability coefficients for scores on Form 11a were computed without regard to the production test form designation. The population subgroups of interest were males, females, Whites, Blacks, and Hispanics.

These subgroup reliability coefficients are presented in Tables C-5 through C-8. Inspection of Tables C-5 and C-7 indicates that the subtest and *composite reliability* coefficients for males are consistently higher than the reliability coefficients for females. In general, the difficulty of most of the subtests is optimal for males and good for females. The two speeded subtests, NO and CS, show the obverse pattern. Although for these speeded subtests the coefficients are higher for males than for females, the subtest reliability coefficients for the females are still good. The composite reliabilities for females are very high for four of the five Air Force composites--.83 or above (see Table C-7). In two subtests the reliability coefficients are considerably larger for males than females. These subtests are Auto and Shop Information ($r_{male}$ = .82; $r_{female}$ = .63) and Electronics Information ($r_m$ = .70, $r_f$ = .52). This is not unexpected, as these subtests are difficult for females; female scores on these subtests are more influenced by guessing, which reduces reliability.

Inspection of Tables C-6 and C-8 indicates that, in general, the reliability coefficients for Forms 8a and 11a against production tests, for both subtests and composites, were higher for Whites than for Hispanics or Blacks. Again, even though these coefficients were higher for Whites, the subtest reliability coefficients for Hispanics and Blacks were adequate. As expected, composite coefficients for Hispanics and Blacks were quite high (.80 to .90 and .83 to .90, respectively). In this regard, it should be remembered that selection and classification decisions are based on composites, not individual subtests.

For the benefit of those readers interested in such data, Appendix D summarizes subtest and composite means, standard deviations, skew, and kurtosis on the various test forms. These data are presented for the total sample and for gender and ethnicity subgroups.

## IV. CONCLUSIONS

### Conclusions - Total Sample

Results showed that the parallel forms reliability coefficients between ASVAB Form 8a and the production tests (Forms 9a through 10b) on the subtests and composites were quite high (.67 through .93). The subtest and composite reliability coefficients between Form 11a and the production tests were also found to be quite high (.68 through .94). Further, the subtest and composite reliability coefficients were quite consistent across test forms. This finding is consistent with the methods used to specify the content and structure of ASVAB subtests and composites across the various forms. The high degree of similarity of measurement precision among forms helps assure consistency, across time, in the meaning of test scores. This is vital for the continued use of ASVAB scores in military manpower selection and assignment programs.

### Conclusions - Subgroups

The subgroup analyses indicated that reliability coefficients for subtests and composites were slightly higher for males than females, and slightly higher for Whites than for Hispanics and Blacks. Even though the coefficients were smaller for females, Blacks, and Hispanics, these reliability coefficients--especially composite reliability coefficients--were still acceptably high. It should be pointed out that subtest scores are never used alone. Only composites scores are used for selection and classification decisions. These results suggest that both ASVAB Form 8a and 11a composite scores are reliable measures of ability for all subgroups.

In summary, this investigation of the alternate forms reliability of ASVAB produced results consistent with previous investigations of ASVAB reliability (Prestwood et al., 1985; Ree et al., 1982). Reliability coefficients were demonstrated to be acceptably high for all subgroups; therefore, the tests can continue to be used with confidence.

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## APPENDIX A: ASVAB COMPOSITION AND AIR FORCE COMPOSITE DEFINITION

Table A-1. **Subtest and Composite Titles and Descriptions of ASVAB Forms 8, 9, 10, and 11**

| **Subtest name (abbreviation)** | **Description** | **No. of items** | **Testing time (minutes)** |
|---|---|---|---|
| General Science (GS) | Knowledge of the physical and biological sciences | 25 | 11 |
| Arithmetic Reasoning (AR) | Word problems emphasizing mathematical reasoning rather than mathematical knowledge | 30 | 36 |
| Word Knowledge (WK) | Understanding the meaning of words; i.e., vocabulary | 35 | 11 |
| Paragraph Comprehension (PC) | Presentation of short paragraphs followed by one or more multiple-choice items | 15 | 13 |
| Numerical Operations (NO) | A speeded test of four arithmetic operations; i.e., addition, subtraction, multiplication, division | 50 | 3 |
| Coding Speed (CS) | A speeded test of matching words and six-digit numbers | 84 | 7 |
| Auto Shop Information (AS) | Knowledge of auto mechanics, shop practices, and tool functions in written and pictorial items | 25 | 11 |
| Mathematics Knowledge (MK) | Knowledge of algebra, geometry, and fractions | 25 | 24 |
| Mechanical Comprehension (MC) | Understanding mechanical principles such as gears, levers, pulleys, and hydraulics in written and pictorial items | 25 | 19 |
| Electronics Information (EI) | Knowledge of electronics and radio principles in written and pictorial items | 20 | 9 |

Table A-2. **Air Force Composite Definitions**

| Composite | Definition |
|---|---|
| Armed Forces Qualification Test (AFQT) | WK+PC+AR+1/2NO |
| Verbal (VE) | WK+PC |
| Mechanical | MC+GS+2AS |
| Administrative | NO+CS+VE |
| General | VE+AR |
| Electronics | AR+MK+EI+GS |

# APPENDIX B: COMPOSITION OF PARTIAL BATTERY BOOKLETS IN CALIBRATION STUDY AND DESCRIPTION OF SAMPLE

Table B-1. **MEPS Test Booklet Composition (11a)**

| Booklet Number | GS | AR | WK | PC | NO | CS | AS | MK | MC | EI | Number of subtests | Total time[a] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 123 | X | X | | | | | | X | | X | 4 | 80 |
| 234 | X | | X | X | X | | X | | X | | 6 | 68 |
| 345 | X | | X | X | | | | X | X | | 5 | 78 |
| 456 | X | | | | | | X | X | X | X | 5 | 74 |
| 567 | | X | X | X | X | X | X | | | | 6 | 81 |
| 678 | | X | X | X | X | X | | | | | 5 | 70 |
| 789 | | X | | | X | | X | | X | X | 5 | 78 |
| 890 | | X | | | | X | X | | X | X | 5 | 82 |
| 901 | | X | | | | X | | X | X | | 4 | 86 |

[a] Total time in minutes does not include administration time.

Table B-2. **MEPS Test Booklet Composition (8a)**

| Booklet Number | GS | AR | WK | PC | NO | CS | AS | MK | MC | EI | Number of subtests | Total time[a] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 147 | X | X | | | | | | X | | X | 4 | 80 |
| 258 | X | | X | X | X | | X | | X | | 6 | 68 |
| 369 | X | | X | X | | | | X | X | | 5 | 78 |
| 470 | X | | | | | | X | X | X | X | 5 | 74 |
| 581 | | X | X | X | X | X | X | | | | 6 | 81 |
| 692 | | X | X | X | X | X | | | | | 5 | 70 |
| 703 | | X | | | X | | X | | X | X | 5 | 78 |
| 814 | | X | | | | X | X | | X | X | 5 | 82 |
| 925 | | X | | | | X | | X | X | | 4 | 86 |

[a] Total time in minutes does not include administration time.

Table B-3. **Total Group and Subgroup Sample Sizes by Production Test Form**

| | ASVAB 9a | ASVAB 9b | ASVAB 10a | ASVAB 10b |
|---|---|---|---|---|
| Total | 12,350 | 11,880 | 19,542 | 19,166 |
| Males | 10,205 | 9,810 | 16,146 | 15,870 |
| Females | 2,145 | 2,070 | 3,396 | 3,296 |
| Black | 2,863 | 2,800 | 4,488 | 4,519 |
| White | 8,494 | 8,064 | 13,439 | 13,013 |
| Hispanic | 547 | 560 | 905 | 915 |
| Other | 446 | 456 | 710 | 719 |

# APPENDIX C. RELIABILITY COEFFICIENTS

Table C-1. **Parallel Forms Reliability Coefficients (r) of Subtests[a] and Composites of ASVAB Form 8a with Forms 9a and 9b**

| Subtests[b] | r (9a) | r (9b) | Composites | r (9a) | r (9b) |
|---|---|---|---|---|---|
| GS | .79 | .80 | MECH[c] | .91 | .90 |
| AR | .87 | .87 | ADM[c] | .88 | .88 |
| WK | .88 | .87 | GEN[c] | .93 | .91 |
| PC | .67 | .67 | ELEC[c] | .93 | .92 |
| NO | .70 | .72 | AFQT[b] | .93 | .92 |
| CS | .75 | .77 | | | |
| AS | .84 | .82 | | | |
| MK | .84 | .84 | | | |
| MC | .78 | .77 | | | |
| EI | .72 | .71 | | | |

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[a] The estimates of the reliability coefficients are correlations with Ns ranging from 3,860 to 680 in Form 9a and from 3,959 to 680 in Form 9b.

[b] Raw scores used to estimate r.

[c] Standard scores used to estimate r.

Table C-2. **Parallel Forms Reliability Coefficients (r) of Subtests[a] and Composites of ASVAB Form 8a with Forms 10a and 10b**

| Subtests[b] | r (10a) | r (10b) | Composites | r (10a) | r (10b) |
|---|---|---|---|---|---|
| GS | .80 | .80 | MECH[c] | .92 | .91 |
| AR | .86 | .86 | ADM[c] | .87 | .87 |
| WK | .87 | .87 | GEN[c] | .92 | .92 |
| PC | .69 | .69 | ELEC[c] | .92 | .92 |
| NO | .72 | .72 | AFQT[b] | .92 | .92 |
| CS | .75 | .75 | | | |
| AS | .83 | .83 | | | |
| MK | .84 | .84 | | | |
| MC | .78 | .79 | | | |
| EI | .70 | .70 | | | |

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[a] The estimates of the reliability coefficients are correlations with Ns ranging from 6,473 to 1,056 in Form 10a and from 6,538 to 1,047 in Form 10b.

[b] Raw scores used to estimate r.

[c] Standard scores used to estimate r.

Table C-3. **Alternate Forms Reliability Coefficients (r) of Subtests[a] and Composites of ASVAB Form 11a with Forms 9a and 9b**

| Subtests[b] | r (9a) | r (9b) | Composites | r (9a) | r (9b) |
|---|---|---|---|---|---|
| GS | .84 | .83 | MECH[c] | .92 | .92 |
| AR | .88 | .88 | ADM[c] | .86 | .88 |
| WK | .89 | .87 | GEN[c] | .93 | .93 |
| PC | .72 | .68 | ELEC[c] | .93 | .93 |
| NO | .68 | .70 | AFQT[b] | .92 | .93 |
| CS | .75 | .75 | | | |
| AS | .85 | .85 | | | |
| MK | .86 | .85 | | | |
| MC | .78 | .76 | | | |
| EI | .72 | .71 | | | |

[a] The estimates of the reliability coefficients are correlations with Ns ranging from 4,512 to 747 in Form 9a and from 4,011 to 648 in Form 9b.

[b] Raw scores used to estimate r.

[c] Standard scores used to estimate r.

Table C-4. **Alternate Forms Reliability Coefficients (r) of Subtests[a] and Composites of ASVAB Form 11a with Forms 10a and 10b**

| Subtests[b] | r (10a) | r (10b) | Composites | r (10a) | r (10b) |
|---|---|---|---|---|---|
| GS | .84 | .83 | MECH[c] | .92 | .91 |
| AR | .87 | .87 | ADM[c] | .86 | .87 |
| WK | .89 | .88 | GEN[c] | .93 | .93 |
| PC | .75 | .69 | ELEC[c] | .93 | .94 |
| NO | .69 | .71 | AFQT[b] | .93 | .93 |
| CS | .72 | .74 | | | |
| AS | .83 | .84 | | | |
| MK | .84 | .85 | | | |
| MC | .79 | .77 | | | |
| EI | .72 | .72 | | | |

[a] The estimates of the reliability coefficients are correlations with Ns ranging from 6,754 to 1,127 in Form 10a and from 6,397 to 1,122 in Form 10b.

[b] Raw scores used to estimate r.

[c] Standard scores used to estimate r.

Table C-5. **Parallel Forms Reliability Coefficients (r) of Subtests and Composites of ASVAB Form 8a with Forms 9a, 9b, 10a, and 10b for Males and Females**[a]

| **Subtests**[b] | **Males** | **Females** |
|---|---|---|
| GS | .80 | .75 |
| AR | .86 | .84 |
| WK | .87 | .87 |
| PC | .68 | .65 |
| NO | .72 | .67 |
| CS | .75 | .73 |
| AS | .82 | .63 |
| MK | .84 | .81 |
| MC | .77 | .69 |
| EI | .70 | .52 |
| **Composites** | | |
| MECH[c] | .91 | .83 |
| ADM[c] | .87 | .87 |
| GEN[c] | .92 | .91 |
| ELEC[c] | .93 | .88 |
| AFQT[b] | .92 | .92 |

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[a] The reliability coefficients reported are correlations between 8a scores and production test scores (9a, 9b, 10a, or 10b). Ns ranges from 17,073 to 2,891 for males and from 3,601 to 572 for females.

[b] Raw scores used to estimate r.

[c] Standard scores used to estimate r.

### Table C-6. Parallel Forms Reliability Coefficients (r) of Subtests and Composites of ASVAB Form 8a with Forms 9a, 9b, 10a, and 10b for Blacks, Hispanics, and Whites[a]

| Subtests[b] | Blacks | Hispanics | Whites |
|---|---|---|---|
| GS | .70 | .73 | .77 |
| AR | .79 | .80 | .85 |
| WK | .84 | .84 | .86 |
| PC | .64 | .66 | .64 |
| NO | .70 | .70 | .72 |
| CS | .72 | .69 | .76 |
| AS | .67 | .79 | .80 |
| MK | .76 | .79 | .84 |
| MC | .63 | .71 | .75 |
| EI | .60 | .66 | .67 |
| **Composites** | | | |
| MECH[c] | .80 | .87 | .89 |
| ADM[c] | .85 | .83 | .87 |
| GEN[c] | .88 | .89 | .91 |
| ELEC[c] | .86 | .85 | .91 |
| AFQT[b] | .90 | .90 | .92 |

[a] The reliability coefficients reported are correlations between 8a scores and production test scores (9a, 9b, 10a, or 10b). Ns ranges from 4,871 to 762 for Blacks, from 955 to 158 for Hispanics, and from 14,058 to 2,417 for Whites.

[b] Raw scores used to estimate r.

[c] Standard scores used to estimate r.

### Table C-7. Alternate Forms Reliability (r) of Subtests and Composites of ASVAB Form 11a with 9a, 9b, 10a, and 10b for Males and Females[a]

| Subtests[b] | Males r (11a) | Females r (11a) | Composites | Males r (11a) | Females r (11a) |
|---|---|---|---|---|---|
| GS | .84 | .80 | MECH[c] | .91 | .85 |
| AR | .87 | .86 | ADM[c] | .87 | .83 |
| WK | .88 | .88 | GEN[c] | .93 | .9[illegible] |
| PC | .71 | .68 | ELEC[c] | .93 | [illegible] |
| NO | .70 | .64 | AFQT[b] | .93 | .9[illegible] |
| CS | .73 | .70 | | | |
| AS | .83 | .69 | | | |
| MK | .86 | .82 | | | |
| MC | .77 | .69 | | | |
| EI | .71 | .56 | | | |

[a] The reliability coefficients reported are correlations between 11a scores and production test scores (9a, 9b, 10a, or 10b). Ns ranges from 17,373 to 3,033 for males and from 3,719 to 611 for females.

[b] Raw scores used to estimate r.

[c] Standard scores used to estimate r.

## Table C-8. Alternate Forms Reliability (r) of Subtests and Composites of ASVAB Form 11a with 9a, 9b, 10a, and 10b for Blacks, Hispanics, and Whites[a]

| Subtests[b] | Blacks<br>r | Hispanics<br>r | Whites<br>r |
|---|---|---|---|
| GS | .77 | .80 | .81 |
| AR | .81 | .84 | .86 |
| WK | .85 | .85 | .87 |
| PC | .65 | .66 | .68 |
| NO | .65 | .69 | .71 |
| CS | .69 | .65 | .75 |
| AS | .73 | .80 | .81 |
| MK | .76 | .82 | .86 |
| MC | .65 | .70 | .73 |
| EI | .59 | .64 | .73 |
| **Composites** | | | |
| MECH[c] | .85 | .89 | .89 |
| ADM[c] | .84 | .83 | .87 |
| GEN[c] | .90 | .89 | .92 |
| ELEC[c] | .89 | .89 | .92 |
| AFQT[b] | .90 | .89 | .92 |

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[a] The reliability coefficients reported are correlations between Form 11a scores and production test scores (9a, 9b, 10a, or 10b). Ns range from 5,112 to 840 for Blacks, from 1,021 to 165 for Hispanics, and from 14,731 to 2,492 for Whites.

[b] Raw scores used to estimate r.

[c] Standard scores used to estimate r.

## APPENDIX D: SUMMARY STATISTICS FOR SUBTESTS AND COMPOSITES

Table D-1. **Means, Standard Deviations, Kurtosis, and Skewness of Subtests and Composites on ASVAB Form 8a (Total Sample)**

| **Subtest**[a] | **Means** | **SD** | **Kurtosis** | **Skewness** |
|---|---|---|---|---|
| GS | 15.95 | 4.43 | -.56 | -.10 |
| AR | 17.74 | 6.53 | -.95 | .09 |
| WK | 26.18 | 6.29 | .10 | -.75 |
| PC | 11.17 | 2.72 | .39 | -.87 |
| NO | 33.89 | 9.16 | -.52 | -.10 |
| CS | 45.15 | 13.31 | .34 | -.18 |
| AS | 15.41 | 5.19 | -.93 | -.12 |
| MK | 13.10 | 5.49 | -.75 | .40 |
| MC | 14.48 | 5.01 | -.86 | -.01 |
| EI | 12.01 | 3.81 | -.65 | -.19 |
| **Air Force Composites** | | | | |
| MECH[b] | 204.25 | 33.06 | -.87 | -.07 |
| ADM[b] | 145.66 | 19.52 | .21 | -.36 |
| GEN[b] | 99.68 | 15.11 | -.59 | -.26 |
| ELEC[b] | 200.70 | 29.70 | -.76 | .10 |
| AFQT[a] | 72.35 | 16.01 | -.28 | -.37 |

[a] Raw scores.

[b] Standard scores.

Table D-2. **Means, Standard Deviations, Kurtosis, and Skewness of Subtests and Composites on ASVAB Form 11a (Total Sample)**

| **Subtest**[a] | **Means** | **SD** | **Kurtosis** | **Skewness** |
|---|---|---|---|---|
| GS | 16.21 | 5.07 | -.69 | -.25 |
| AR | 18.97 | 6.88 | -1.01 | -.17 |
| WK | 25.28 | 7.01 | -.47 | -.56 |
| PC | 11.05 | 3.07 | -.43 | -.58 |
| NO | 33.62 | 8.65 | -.27 | -.06 |
| CS | 44.76 | 13.11 | .22 | -.04 |
| AS | 15.69 | 5.57 | -.92 | -.24 |
| MK | 12.84 | 5.96 | -.88 | .38 |
| MC | 15.52 | 4.98 | -.75 | -.22 |
| EI | 11.63 | 4.07 | -.80 | .07 |
| **Air Force Composites** | | | | |
| MECH[b] | 204.98 | 32.36 | -.80 | -.21 |
| ADM[b] | 145.07 | 19.65 | .11 | -.26 |
| GEN[b] | 99.55 | 15.38 | -.71 | -.32 |
| ELEC[b] | 200.41 | 29.95 | -.85 | .05 |
| AFQT[a] | 72.41 | 17.36 | -.43 | -.38 |

[a] Raw scores.

[b] Standard scores.

## Table D-3. Means, Standard Deviations, Kurtosis, and Skewness of Subtests and Composites on ASVAB Form 9a (Total Sample)

| Subtest[a] | Means | SD | Kurtosis | Skewness |
|---|---|---|---|---|
| GS | 15.74 | 4.81 | -.66 | -.20 |
| AR | 18.51 | 6.53 | -1.00 | -.01 |
| WK | 25.47 | 6.60 | -.50 | -.47 |
| PC | 10.33 | 3.06 | -.34 | -.58 |
| NO | 39.43 | 8.84 | .23 | -.83 |
| CS | 48.93 | 13.92 | .20 | -.06 |
| AS | 16.17 | 5.25 | -.84 | -.27 |
| MK | 12.86 | 5.41 | -.56 | .54 |
| MC | 15.13 | 4.84 | -.76 | -.13 |
| EI | 12.26 | 3.67 | -.47 | -.11 |
| **Air Force Composites** | | | | |
| MECH[b] | 207.92 | 32.99 | -.80 | -.20 |
| ADM[b] | 151.39 | 19.97 | .20 | -.49 |
| GEN[b] | 99.24 | 15.99 | -.77 | -.20 |
| ELEC[b] | 200.64 | 29.83 | -.69 | .14 |
| AFQT[a] | 74.27 | 16.85 | -.45 | -.34 |

[a] Raw scores.

[b] Standard scores.

## Table D-4. Means, Standard Deviations, Kurtosis, and Skewness of Subtests and Composites on ASVAB Form 9b (Total Sample)

| Subtest[a] | Means | SD | Kurtosis | Skewness |
|---|---|---|---|---|
| GS | 15.57 | 4.81 | -.68 | -.18 |
| AR | 18.70 | 6.48 | -.96 | .01 |
| WK | 25.74 | 6.40 | -.13 | -.60 |
| PC | 10.95 | 2.62 | .35 | -.74 |
| NO | 38.87 | 8.83 | -.01 | -.71 |
| CS | 49.39 | 13.97 | .13 | -.05 |
| AS | 15.96 | 5.32 | -.85 | -.20 |
| MK | 12.74 | 5.47 | -.58 | [illegible] |
| MC | 15.01 | 4.84 | -.71 | [illegible] |
| EI | 12.14 | 3.66 | -.38 | -.11 |
| **Air Force Composites** | | | | |
| MECH[b] | 206.59 | 33.24 | -.81 | -.18 |
| ADM[b] | 151.98 | 19.55 | .27 | -.52 |
| GEN[b] | 100.33 | 15.31 | -.62 | -.20 |
| ELEC[b] | 200.08 | 29.65 | -.68 | .16 |
| AFQT[a] | 75.06 | 16.30 | -.29 | -.40 |

[a] Raw scores.

[b] Standard scores.

Table D-5. **Means, Standard Deviations, Kurtosis and Skewness of Subtests and Composites on ASVAB Form 10a (Total Sample)**

| Subtest[a] | Means | SD | Kurtosis | Skewness |
|---|---|---|---|---|
| GS | 15.81 | 4.65 | -.50 | -.24 |
| AR | 19.29 | 6.24 | -.94 | -.11 |
| WK | 24.95 | 6.94 | -.71 | -.37 |
| PC | 10.77 | 3.24 | -.33 | -.67 |
| NO | 38.95 | 8.74 | .28 | -.80 |
| CS | 50.44 | 13.95 | .24 | -.13 |
| AS | 16.30 | 5.27 | -.81 | -.20 |
| MK | 13.59 | 5.23 | -.71 | .09 |
| MC | 15.13 | 4.88 | -.76 | -.09 |
| EI | 12.35 | 3.61 | -.16 | -.26 |
| Air Force Composites | | | | |
| MECH[b] | 206.50 | 32.69 | -.74 | -.23 |
| ADM[b] | 151.76 | 20.42 | .28 | -.53 |
| GEN[b] | 100.23 | 16.06 | -.76 | -.25 |
| ELEC[b] | 203.18 | 29.09 | -.63 | .03 |
| AFQT[a] | 74.73 | 17.09 | -.42 | -.39 |

[a] Raw scores.

[b] Standard scores.

Table D-6. **Means, Standard Deviations, Kurtosis and Skewness of Subtests and Composites on ASVAB Form 10b (Total Sample)**

| Subtest[a] | Means | SD | Kurtosis | Skewness |
|---|---|---|---|---|
| GS | 15.75 | 4.62 | -.48 | -.24 |
| AR | 18.54 | 6.44 | -.97 | .02 |
| WK | 24.97 | 6.67 | -.56 | -.40 |
| PC | 10.95 | 2.62 | .29 | -.69 |
| NO | 39.02 | 8.64 | .04 | -.71 |
| CS | 50.71 | 13.90 | .17 | -.08 |
| AS | 16.19 | 5.23 | -.80 | -.24 |
| MK | 13.73 | 5.32 | -.77 | .05 |
| MC | 15.00 | 4.89 | -.76 | -.08 |
| EI | 12.16 | 3.56 | -.24 | -.20 |
| Air Force Composites | | | | |
| MECH[b] | 207.74 | 32.44 | -.80 | -.21 |
| ADM[b] | 152.19 | 19.73 | .19 | -.43 |
| GEN[b] | 99.40 | 15.47 | -.72 | -.26 |
| ELEC[b] | 201.81 | 29.33 | -.60 | .05 |
| AFQT[b] | 74.20 | 16.45 | -.33 | -.35 |

[a] Raw scores.

[b] Standard scores.

Table 6-7. Means, Standard Deviations, [illegible] and Skewness [illegible] and Composites on ASVAB Form 8a (Males and Females)

| Subtest[a] | Means Males | Means Females | SD Males | SD Females | Kurtosis Males | Kurtosis Females | Skewness Males | Skewness Females |
|---|---|---|---|---|---|---|---|---|
| GS | 16.22 | 14.6[illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| AR | 18.56 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| WK | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| PC | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| NO | 33.22 | 3[illegible].12 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| CS | 43.95 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| AS | 16.34 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| MK | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| MC | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| EI | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| **Air Force Composites** | | | | | | | | |
| MECH[b] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| ADM[b] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| GEN[b] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| ELEC[b] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| AFQT[a] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

[a] Raw Scores.

[b] Standard [illegible]

Table B-8. **Means, Standard Deviations, Kurtosis, and Skewness of Subtests and Composites on ASVAB Form 8a (Blacks, Hispanics, and Whites)**

| | **Means** | | | SD | | | Kurtosis | | | Skewness | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Subtest**[a] | **Blacks** | **Hispanics** | **Whites** | **Blacks** | **Hispanics** | **Whites** | **Blacks** | **Hispanics** | **Whites** | **Blacks** | **Hispanics** | **Whites** |
| GS | 12.98 | 14.11 | 17.14 | 3.93 | 4.00 | 4.06 | -.13 | -.35 | -.43 | .26 | .21 | -.21 |
| AR | 13.50 | 15.80 | 19.31 | 5.31 | 5.56 | 6.27 | .07 | -.57 | -.91 | .67 | .31 | -.13 |
| WK | 22.37 | 23.97 | 27.69 | 6.67 | 6.16 | 5.47 | -.54 | -.15 | .78 | -.23 | -.39 | -.93 |
| PC | 9.76 | 10.23 | 11.74 | 2.89 | 2.79 | 2.44 | -.36 | -.06 | 1.10 | -.45 | -.60 | -1.06 |
| NO | 31.99 | 34.39 | 34.43 | 9.57 | 9.07 | 8.91 | -.48 | -.31 | -.58 | -.04 | -.25 | -.08 |
| CS | 41.46 | 44.96 | 46.37 | 13.77 | 14.07 | 12.84 | .24 | .19 | .44 | -.06 | -.24 | -.19 |
| AS | 10.93 | 13.70 | 17.13 | 3.92 | 4.95 | 4.57 | .23 | -.77 | -.67 | .57 | .16 | -.36 |
| MK | 10.78 | 11.55 | 14.03 | 4.67 | 5.03 | 5.50 | .16 | -.25 | -.90 | .78 | .58 | .25 |
| MC | 10.46 | 13.14 | 16.03 | 3.82 | 4.52 | 4.60 | .18 | -.44 | -.64 | .60 | .18 | -.26 |
| EI | 9.19 | 10.93 | 13.11 | 3.30 | 3.65 | 3.43 | -.16 | -.52 | -.34 | .33 | .10 | -.36 |
| **Air Force Composites** | | | | | | | | | | | | |
| MECH[b] | 174.49 | 193.03 | 216.16 | 24.22 | 27.74 | 28.70 | .44 | -.57 | -.53 | .05 | -.21 | -.31 |
| ADM[b] | 136.59 | 143.24 | 148.73 | 19.74 | 19.82 | 18.39 | .04 | .45 | .35 | -.23 | -.50 | -.39 |
| GEN[b] | 89.50 | 94.28 | 103.43 | 13.90 | 14.49 | 13.80 | -.42 | -.38 | -.33 | .18 | .08 | -.40 |
| ELEC[b] | 177.45 | 188.85 | 209.11 | 23.09 | 25.04 | 27.35 | .61 | -.19 | -.59 | -.81 | .50 | -.08 |
| AFQT[a] | 62.27 | 67.67 | 75.99 | 15.18 | 15.76 | 14.71 | -.26 | -.02 | .02 | -.03 | -.15 | -.49 |

[a] Raw scores.

[b] Standard scores.

Table D-9. **Means, Standard Deviations, Kurtosis, and Skewness of Subtests and Composites on ASVAB Form 11a (Males and Females)**

| | **Means** | | SD | | Kurtosis | | Skewness | |
|---|---|---|---|---|---|---|---|---|
| **Subtest[a]** | **Males** | **Females** | **Males** | **Females** | **Males** | **Females** | **Males** | **Females** |
| GS | 16.41 | 15.25 | 5.11 | 4.74 | -.68 | -.57 | -.29 | -.09 |
| AR | 19.15 | 18.08 | 6.89 | 6.77 | -1.00 | -1.00 | -.20 | -.02 |
| WK | 25.13 | 25.97 | 7.08 | 6.63 | -.50 | -.36 | -.55 | -.60 |
| PC | 10.99 | 11.34 | 3.11 | 2.87 | -.47 | -.31 | -.58 | -.59 |
| NO | 33.04 | 36.39 | 8.59 | 8.39 | -.21 | -.43 | -.03 | -.21 |
| CS | 43.49 | 50.76 | 12.65 | 13.56 | .29 | -.19 | -.06 | -.20 |
| AS | 16.78 | 10.48 | 5.23 | 4.02 | -.65 | -.25 | -.45 | .37 |
| MK | 12.90 | 12.56 | 6.02 | 5.65 | -.90 | -.79 | .37 | .41 |
| MC | 16.09 | 12.76 | 4.89 | 4.45 | -.66 | -.60 | -.33 | .13 |
| EI | 12.12 | 9.23 | 4.04 | 3.28 | -.79 | -.05 | -.05 | .46 |
| **Air Force Composites** | | | | | | | | |
| MECH[b] | 210.20 | 180.82 | 31.34 | 25.27 | -.61 | -.30 | -.39 | .23 |
| ADM[b] | 143.39 | 152.75 | 19.49 | 18.51 | .12 | .17 | -.26 | -.30 |
| GEN[b] | 99.55 | 99.58 | 15.54 | 14.63 | -.72 | -.73 | -.33 | -.24 |
| ELEC[b] | 202.02 | 192.39 | 30.05 | 28.12 | -.85 | -.75 | .01 | .21 |
| AFQT[a] | 72.00 | 74.27 | 17.55 | 16.35 | -.45 | -.40 | -.38 | -.33 |

[a] Raw scores.

[b] Standard scores.

Table D-10. **Means, Standard Deviations, Kurtosis, and Skewness of Subtests and Composites on ASVAB Form 11a (Blacks, Hispanics, and Whites)**

| | **Means** | | | **SD** | | | **Kurtosis** | | | **Skewness** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subtest$^{a}$ | Blacks | Hispanics | Whites | Blacks | Hispanics | Whites | Blacks | Hispanics | Whites | Blacks | Hispanics | Whites |
| GS | 13.01 | 14.33 | 17.52 | 4.73 | 4.72 | 4.62 | -.52 | -.77 | -.49 | .16 | .15 | -.40 |
| AR | 14.45 | 17.15 | 20.75 | 5.94 | 6.39 | 6.42 | -.47 | -.82 | -.76 | .44 | .10 | -.43 |
| WK | 20.87 | 22.56 | 27.10 | 7.13 | 7.04 | 6.09 | -.74 | -.76 | .02 | .01 | -.17 | -.76 |
| PC | 9.41 | 10.45 | 11.69 | 3.03 | 3.03 | 2.84 | -.59 | -.47 | .02 | -.08 | -.40 | -.82 |
| NO | 31.71 | 33.53 | 34.28 | 8.98 | 8.76 | 8.39 | -.23 | -.08 | -.34 | -.04 | -.22 | -.02 |
| CS | 40.96 | 45.27 | 46.09 | 13.37 | 13.18 | 12.70 | .24 | .25 | .27 | .08 | -.11 | -.04 |
| AS | 10.98 | 13.45 | 17.55 | 4.57 | 5.09 | 4.83 | -.27 | -.89 | -.55 | .48 | .03 | -.49 |
| MK | 10.31 | 11.77 | 13.85 | 5.00 | 5.71 | 6.01 | .04 | -.59 | -1.04 | .76 | .55 | .21 |
| MC | 11.39 | 14.03 | 17.12 | 4.13 | 4.50 | 4.37 | -.18 | -.61 | -.37 | .42 | -.10 | -.44 |
| EI | 8.94 | 9.81 | 12.73 | 3.40 | 3.53 | 3.82 | .23 | -.48 | -.74 | .60 | .37 | -.12 |
| **Air Force Composites** | | | | | | | | | | | | |
| MECH$^{b}$ | 175.72 | 191.80 | 216.85 | 25.74 | 29.33 | 27.20 | .11 | -.74 | -.42 | .54 | .04 | -.40 |
| ADM$^{b}$ | 135.03 | 143.40 | 148.87 | 19.08 | 19.99 | 18.50 | .13 | .37 | .14 | -.17 | -.54 | -.25 |
| GEN$^{b}$ | 88.72 | 93.85 | 104.01 | 14.01 | 14.37 | 13.66 | -.47 | -.56 | -.39 | .25 | -.08 | -.52 |
| ELEC$^{b}$ | 179.48 | 188.19 | 208.76 | 25.18 | 26.20 | 27.77 | .07 | -.31 | -.76 | .62 | .50 | -.13 |
| AFQT$^{a}$ | 60.66 | 66.98 | 77.17 | 16.15 | 16.62 | 15.54 | -.29 | -.23 | -.10 | .07 | -.30 | -.54 |

$^{a}$Raw scores.

$^{b}$Standard scores.

## Table D-11. Means, Standard Deviations, Kurtosis, and Skewness of Subtests and Composites on ASVAB Form 9a (Males and Females)

| | Means | | SD | | Kurtosis | | Skewness | |
|---|---|---|---|---|---|---|---|---|
| Subtest[a] | Males | Females | Males | Females | Males | Females | Males | Females |
| GS | 15.97 | 14.64 | 4.88 | 4.26 | -.67 | -.50 | -.26 | -.07 |
| AR | 18.73 | 17.48 | 6.56 | 6.28 | -1.01 | .94 | -.04 | .10 |
| WK | 25.49 | 25.37 | 6.64 | 6.41 | -.48 | -.59 | -.49 | -.39 |
| PC | 10.33 | 10.34 | 3.09 | 2.90 | -.37 | -.17 | -.58 | -.60 |
| NO | 38.86 | 42.16 | 8.95 | 7.74 | .11 | -1.32 | -.76 | -1.22 |
| CS | 47.60 | 55.27 | 13.46 | 14.32 | .32 | .03 | -.08 | -.24 |
| AS | 17.20 | 11.32 | 4.89 | 4.08 | -.58 | -.23 | -.44 | .37 |
| MK | 12.96 | 12.39 | 5.48 | 5.02 | -.62 | -.25 | .52 | .63 |
| MC | 15.79 | 11.98 | 4.72 | 4.14 | -.64 | -.36 | -.26 | .37 |
| EI | 12.83 | 9.55 | 3.56 | 2.91 | -.32 | .09 | -.24 | .19 |
| **Air Force Composites** | | | | | | | | |
| MECH[b] | 213.31 | 182.29 | 31.70 | 26.27 | -.59 | -.35 | -.36 | .33 |
| ADM[b] | 150.08 | 157.64 | 20.02 | 18.53 | .18 | .37 | -.47 | -.59 |
| GEN[b] | 99.56 | 97.76 | 16.12 | 15.25 | -.77 | -.73 | -.22 | -.12 |
| ELEC[b] | 202.89 | 189.90 | 30.10 | 25.98 | -.72 | -.42 | .08 | .31 |
| AFQT[a] | 74.21 | 74.51 | 17.09 | 15.69 | -.47 | -.42 | -.35 | -.29 |

[a] Raw scores.

[b] Standard scores.

Table D-12. **Means, Standard Deviations, Kurtosis, and Skewness of Subtests and Composites on ASVAB Form 9a (Blacks, Hispanics, and Whites)**

| | Means | | | SD | | | Kurtosis | | | Skewness | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subtest[a] | Blacks | Hispanics | Whites | Blacks | Hispanics | Whites | Blacks | Hispanics | Whites | Blacks | Hispanics | Whites |
| GS | 12.42 | 13.82 | 17.10 | 4.27 | 4.53 | 4.31 | -.27 | -.66 | -.43 | .26 | .22 | -.35 |
| AR | 14.34 | 16.23 | 20.13 | 5.42 | 5.91 | 6.21 | -.16 | -.69 | -.88 | .55 | .19 | -.24 |
| WK | 21.51 | 22.82 | 27.11 | 6.63 | 6.37 | 5.85 | -.65 | -.66 | -.07 | .05 | .01 | -.65 |
| PC | 8.47 | 9.32 | 11.08 | 3.01 | 3.10 | 2.73 | -.69 | -.50 | .27 | -.08 | -.38 | -.80 |
| NO | 37.16 | 38.65 | 40.28 | 9.47 | 9.13 | 8.42 | .03 | .36 | .20 | -.68 | -.84 | -.86 |
| CS | 44.62 | 48.66 | 50.43 | 13.90 | 13.45 | 13.56 | .28 | -.30 | .25 | .07 | -.13 | -.08 |
| AS | 11.73 | 14.13 | 17.90 | 4.30 | 4.78 | 4.56 | -.15 | -.56 | -.30 | .47 | .13 | -.55 |
| MK | 10.42 | 11.17 | 13.80 | 4.20 | 4.68 | 5.51 | .97 | .21 | -.83 | .91 | .72 | .37 |
| MC | 11.52 | 13.82 | 16.48 | 4.04 | 4.34 | 4.45 | -.19 | -.49 | -.47 | .45 | .02 | -.34 |
| EI | 10.07 | 11.27 | 13.11 | 3.18 | 3.36 | 3.49 | -.03 | -.18 | -.27 | .21 | .08 | -.28 |
| **Air Force Composites** | | | | | | | | | | | | |
| MECH[b] | 178.51 | 194.22 | 219.40 | 25.87 | 28.87 | 28.19 | -.03 | -.40 | -.32 | .52 | .26 | -.42 |
| ADM[b] | 141.23 | 147.04 | 155.32 | 19.82 | 19.45 | 18.64 | .12 | .40 | .39 | -.27 | -.50 | -.56 |
| GEN[b] | 88.10 | 92.70 | 103.68 | 14.03 | 14.69 | 14.53 | -.30 | -.56 | -.45 | .37 | .12 | -.41 |
| ELEC[b] | 179.34 | 188.75 | 209.02 | 23.52 | 25.91 | 27.86 | .38 | -.11 | -.63 | .65 | .45 | -.01 |
| AFQT[a] | 63.14 | 67.93 | 78.69 | 15.30 | 15.77 | 15.37 | -.18 | -.31 | -.07 | .10 | -.14 | -.54 |

[a] Raw scores.

[b] Standard scores.

Table D-13. **Means, Standard Deviations, Kurtosis, and Skewness of Subtests and Composites on ASVAB Form 9b (Males and Females)**

| | **Means** | | **SD** | | Kurtosis | | Skewness | |
|---|---|---|---|---|---|---|---|---|
| ***Subtest*[a]** | **Males** | Females | **Males** | Females | Males | **Females** | Males | Females |
| GS | 15.78 | 14.57 | 4.87 | 4.34 | -.67 | -.60 | -.23 | -.04 |
| AR | 18.90 | 17.75 | 6.53 | 6.16 | -.97 | -.76 | -.04 | .25 |
| WK | 25.60 | 26.38 | 6.46 | 6.11 | -.16 | -.06 | -.65 | -.68 |
| PC | 10.89 | 11.24 | 2.66 | 2.41 | -.34 | .21 | -.74 | -.67 |
| NO | 38.30 | 41.57 | 8.91 | 7.87 | -.12 | -.96 | -.64 | -1.10 |
| CS | 48.01 | 55.97 | 13.57 | 13.96 | .22 | .07 | -.06 | -.23 |
| AS | 16.97 | 11.21 | 4.99 | 4.14 | -.61 | -.38 | -.44 | .33 |
| MK | 12.79 | 12.54 | 5.53 | 5.15 | -.62 | -.34 | .51 | .58 |
| MC | 15.70 | 11.78 | 4.72 | 4.05 | -.57 | -.26 | -.26 | .34 |
| EI | 12.70 | 9.47 | 3.55 | 2.89 | -.18 | .26 | -.25 | .29 |
| **Air Force Composites** | | | | | | | | |
| MECH[b] | 211.91 | 181.41 | 32.03 | 26.63 | -.63 | -.46 | -.34 | .32 |
| ADM[b] | 150.44 | 159.31 | 19.56 | 17.75 | .24 | .74 | -.49 | -.68 |
| GEN[b] | 100.42 | 99.93 | 15.49 | 14.40 | -.63 | -.59 | -.29 | -.11 |
| ELEC[b] | 202.16 | 190.21 | 29.92 | 26.16 | -.71 | -.34 | .11 | .42 |
| AFQT[a] | 74.78 | 76.39 | 16.56 | 14.94 | -.34 | -.13 | -.40 | -.33 |

[a] Raw scores.

[b] Standard scores.

## Table D-14. Means, Standard Deviations, Kurtosis, and Skewness of Subtests and Composites on ASVAB Form 9b (Blacks, Hispanics, and Whites)

| | Means | | | SD | | | Kurtosis | | | Skewness | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subtest[a] | Blacks | Hispanics | Whites | Blacks | Hispanics | Whites | Blacks | Hispanics | Whites | Blacks | Hispanics | Whites |
| GS | 12.24 | 13.66 | 16.95 | 4.26 | 4.38 | 4.34 | -.31 | -.50 | -.47 | .25 | .13 | -.34 |
| AR | 14.63 | 16.85 | 20.33 | 5.48 | 5.71 | 6.19 | -.17 | -.50 | -.86 | .55 | .26 | -.22 |
| WK | 22.03 | 23.73 | 27.27 | 6.60 | 6.10 | 5.69 | -.56 | -.17 | .36 | -.19 | -.40 | -.83 |
| PC | 9.67 | 10.22 | 11.50 | 2.78 | 2.66 | 2.34 | -.18 | -.49 | .87 | -.39 | -.36 | -.86 |
| NO | 36.69 | 38.17 | 39.70 | 9.42 | 8.63 | 8.46 | -.26 | -.33 | .07 | -.55 | -.54 | -.76 |
| CS | 45.80 | 48.58 | 50.72 | 14.22 | 13.65 | 13.66 | .09 | .43 | .13 | .01 | -.20 | -.04 |
| AS | 11.46 | 13.83 | 17.78 | 4.31 | 4.71 | 4.61 | -.31 | -.48 | -.33 | .43 | .06 | -.55 |
| MK | 10.34 | 11.49 | 13.70 | 4.38 | 4.81 | 5.58 | .60 | .24 | -.82 | .87 | .73 | .35 |
| MC | 11.66 | 13.54 | 16.34 | 4.00 | 4.52 | 4.52 | -.24 | -.54 | -.42 | .32 | .00 | -.35 |
| EI | 10.04 | 11.00 | 13.00 | 3.15 | 3.42 | 3.50 | -.05 | -.30 | -.15 | .17 | .01 | -.27 |
| **Air Force Composites** | | | | | | | | | | | | |
| MECH[b] | 177.41 | 192.38 | 218.41 | 26.16 | 28.40 | 28.53 | -.10 | -.30 | -.41 | .49 | .10 | -.40 |
| ADM[b] | 143.14 | 148.29 | 155.50 | 19.74 | 18.80 | 18.42 | .12 | .16 | .40 | -.42 | -.45 | -.55 |
| GEN[b] | 96.13 | 95.29 | 104.49 | 13.88 | 13.83 | 13.99 | -.39 | -.41 | -.33 | .21 | -.12 | -.45 |
| ELEC[b] | 179.19 | 189.13 | 208.58 | 23.48 | 25.46 | 27.69 | .31 | -.10 | -.65 | .64 | .40 | .02 |
| AFQT[a] | 64.93 | 70.12 | 79.18 | 15.23 | 14.98 | 15.00 | -.22 | -.15 | -.03 | -.09 | -.29 | -.56 |

[illegible]

[illegible]

Table D-15. **Means, Standard Deviations, Kurtosis, and Skewness** of Subtests **and Composites on ASVAB Form 10a (Males and Females)**

| Subtest[a] | Means |  | SD |  | Kurtosis |  | Skewness |  |
|---|---|---|---|---|---|---|---|---|
|  | Males | Females | Males | Females | Males | Females | Males | Females |
| GS | 16.07 | 14.57 | 4.62 | 4.60 | -.45 | -.59 | -.26 | [illegible] |
| AR | 19.56 | 18.04 | 6.28 | 5.87 | -.93 | -.81 | -.16 | .10 |
| WK | 24.93 | 25.06 | 6.99 | 6.70 | -.72 | -.60 | [illegible] | -.35 |
| PC | 10.71 | 11.04 | 3.29 | 2.99 | -.39 | -.11 | -.66 | -.70 |
| NO | 38.44 | 41.35 | 8.79 | 8.13 | .19 | 1.26 | [illegible] | -1.20 |
| CS | 49.07 | 56.96 | 13.56 | 13.90 | .35 | .25 | -.15 | [illegible] |
| AS | 17.26 | 11.71 | 4.98 | 4.03 | -.54 | -.36 | [illegible] | [illegible] |
| MK | 13.68 | 13.14 | 5.31 | 4.75 | -.77 | -.38 | .10 | .50 |
| MC | 15.76 | 12.13 | 4.78 | 4.19 | -.71 | -.46 | [illegible] | .23 |
| EI | 12.82 | 10.08 | 3.55 | 3.02 | .05 | .11 | -.41 | -.04 |
| **Air Force Composites** |  |  |  |  |  |  |  |  |
| MECH[b] | 213.68 | [illegible] | 31.42 | 26.91 | -.54 | -.54 | -.45 | [illegible] |
| ADM[b] | 150.39 | 158.27 | 20.46 | 18.97 | .22 | .92 | -.44 | [illegible] |
| GEN[b] | 100.51 | [illegible] | 16.65 | 15.12 | -.76 | -.70 | [illegible] | -.14 |
| ELEC[b] | 205.32 | 193.00 | 29.17 | 26.46 | -.63 | -.41 | -.04 | [illegible] |
| AFQT[a] | 74.66 | 75.06 | 17.33 | 15.69 | -.45 | -.32 | -.40 | -.30 |

[a] Raw scores.

[b] Standard scores.

Table D-16. **Means, Standard Deviations, Kurtosis, and Skewness of Subtests and Composites on ASVAB Form 10a (Blacks, Hispanics, and Whites)**

| | **Means** | | | **SD** | | | **Kurtosis** | | | **Skewness** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Subtest[a]** | **Blacks** | **Hispanics** | **Whites** | **Blacks** | **Hispanics** | **Whites** | **Blacks** | **Hispanics** | **Whites** | **Blacks** | **Hispanics** | **Whites** |
| GS | 12.47 | 13.95 | 17.13 | 4.30 | 4.42 | 4.11 | -.34 | -.31 | -.24 | .23 | .02 | -.34 |
| AR | 15.18 | 17.78 | 20.84 | 5.29 | 5.71 | 5.89 | -.30 | -.68 | -.73 | .45 | .11 | -.35 |
| WK | 20.99 | 23.02 | 26.54 | 6.73 | 6.65 | 6.37 | -.60 | -.74 | .40 | .14 | -.11 | -.56 |
| PC | 8.86 | 10.27 | 11.50 | 3.24 | 3.13 | 2.94 | -.74 | -.29 | .35 | -.11 | -.58 | -.94 |
| NO | 36.68 | 38.44 | 39.76 | 9.49 | 8.67 | 8.32 | .01 | -.40 | .27 | -.66 | -.77 | -.81 |
| CS | 46.25 | 50.78 | 51.85 | 14.34 | 13.58 | 13.52 | .15 | .34 | .27 | -.07 | -.23 | -.09 |
| AS | 12.06 | 14.45 | 17.95 | 4.42 | 5.08 | 4.62 | -.39 | -.82 | -.40 | .33 | -.10 | -.52 |
| MK | 11.02 | 12.48 | 14.55 | 4.15 | 4.73 | 5.27 | .66 | .25 | -.88 | .83 | .56 | .20 |
| MC | 11.41 | 13.80 | 16.53 | 3.95 | 4.50 | 4.49 | -.06 | -.44 | -.51 | .43 | .08 | -.31 |
| EI | 10.03 | 11.50 | 13.21 | 3.23 | 3.45 | 3.37 | -.13 | -.09 | .31 | .05 | -.23 | -.45 |
| **Air Force Composites** | | | | | | | | | | | | |
| MECH[b] | 179.60 | 195.66 | 219.73 | 26.44 | 30.06 | 27.88 | -.22 | -.59 | -.31 | .39 | -.02 | -.45 |
| ADM[b] | 141.63 | 149.20 | 155.54 | 20.32 | 19.23 | 19.23 | .07 | .43 | .50 | -.39 | -.47 | -.60 |
| GEN[b] | 89.12 | 95.89 | 104.51 | 14.24 | 14.73 | 14.71 | -.43 | -.59 | -.41 | .30 | -.03 | -.47 |
| ELEC[b] | 181.44 | 193.66 | 211.47 | 23.92 | 26.03 | 26.73 | .16 | -.36 | -.49 | .52 | .23 | -.10 |
| AFQT[a] | 63.61 | 70.53 | 79.00 | 15.73 | 15.73 | 15.70 | -.34 | -.30 | .00 | .02 | -.22 | -.60 |

[a] Raw scores.

[b] Standard scores.

## Table D-17. Means, Standard Deviations, Kurtosis, and Skewness of Subtests and Composites on ASVAB Form 10b (Males and Females)

| | Means | | SD | | Kurtosis | | Skewness | |
|---|---|---|---|---|---|---|---|---|
| Subtest[a] | Males | Females | Males | Females | Males | Females | Males | Females |
| GS | 16.01 | 14.50 | 4.63 | 4.38 | -.43 | -.46 | -.30 | -.01 |
| AR | 18.74 | 17.57 | 6.49 | 6.07 | -.99 | -.77 | -.02 | .20 |
| WK | 24.82 | 25.71 | 6.72 | 6.35 | -.57 | -.59 | -.45 | -.45 |
| PC | 10.92 | 11.09 | 2.66 | 2.40 | -.25 | .37 | -.70 | -.62 |
| NO | 38.46 | 41.68 | 8.92 | 7.92 | -.05 | .77 | -.65 | -1.04 |
| CS | 49.34 | 57.32 | 13.54 | 13.73 | .28 | -.04 | -.09 | -.21 |
| AS | 17.15 | 11.53 | 4.94 | 3.86 | -.61 | -.32 | -.43 | .30 |
| MK | 13.81 | 13.36 | 5.42 | 4.79 | -.83 | -.52 | .33 | .42 |
| MC | 15.65 | 11.91 | 4.80 | 4.10 | -.71 | -.26 | -.20 | .31 |
| EI | 12.65 | 9.79 | 3.49 | 2.86 | -.05 | .07 | -.33 | .04 |
| **Air Force Composites** | | | | | | | | |
| MECH[b] | 212.95 | 182.64 | 31.25 | 25.63 | -.60 | -.47 | -.37 | .27 |
| ADM[b] | 150.68 | 159.47 | 19.77 | 17.86 | .19 | .13 | -.46 | -.52 |
| GEN[b] | 99.50 | 98.92 | 15.68 | 14.42 | -.74 | -.66 | -.22 | -.06 |
| ELEC[b] | 203.88 | 191.84 | 29.59 | 25.67 | -.67 | -.42 | .02 | .30 |
| AFQT[a] | 73.94 | 75.45 | 16.72 | 15.02 | -.43 | -.32 | -.35 | -.30 |

[a] Raw scores.

[b] Standard scores.

Table D-18. **Means, Standard Deviations, Kurtosis, and Skewness of Subtests and Composites on ASVAB Form 10b (Blacks, Hispanics, and Whites)**

| | **Means** | | | **SD** | | | **Kurtosis** | | | **Skewness** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Subtest**[a] | **Blacks** | **Hispanics** | **Whites** | **Blacks** | **Hispanics** | **Whites** | **Blacks** | **Hispanics** | **Whites** | **Blacks** | **Hispanics** | **Whites** |
| GS | 12.62 | 13.99 | 17.06 | 4.26 | 4.36 | 4.13 | -.36 | -.31 | -.25 | .16 | .02 | -.34 |
| AR | 14.73 | 16.80 | 20.03 | 5.43 | 5.91 | 6.20 | -.10 | -.50 | -.87 | .59 | .29 | -.22 |
| WK | 21.66 | 22.30 | 26.62 | 6.56 | 6.35 | 6.00 | -.68 | -.72 | -.12 | .04 | -.04 | -.67 |
| PC | 9.67 | 10.30 | 11.48 | 2.69 | 2.61 | 2.40 | -.08 | -.06 | .64 | -.45 | -.56 | -.79 |
| NO | 36.96 | 38.36 | 39.77 | 9.44 | 8.78 | 8.48 | .19 | -.17 | .10 | -.56 | -.55 | -.76 |
| CS | 47.11 | 50.49 | 51.96 | 14.11 | 13.89 | 13.55 | .11 | .31 | .21 | -.02 | -.22 | -.06 |
| AS | 12.05 | 14.29 | 17.86 | 4.26 | 5.02 | 4.61 | -.26 | -.88 | -.48 | .39 | .05 | -.50 |
| MK | 11.23 | 12.53 | 14.70 | 4.28 | 4.80 | 5.37 | .45 | -.15 | -.94 | .76 | .57 | .16 |
| MC | 11.30 | 13.73 | 16.44 | 3.89 | 4.37 | 4.52 | -.05 | -.60 | -.53 | .39 | .11 | -.31 |
| EI | 10.02 | 11.44 | 12.99 | 3.13 | 3.41 | 3.37 | -.10 | -.34 | .08 | .04 | .06 | -.35 |
| **Air Force Composites** | | | | | | | | | | | | |
| MECH[b] | 179.64 | 194.98 | 219.07 | 25.61 | 29.26 | 27.92 | -.11 | -.77 | -.34 | .45 | .03 | -.44 |
| ADM[b] | 143.36 | 148.35 | 155.70 | 19.71 | 19.23 | 16.63 | .06 | -.03 | .38 | -.33 | -.34 | -.53 |
| GEN[b] | 89.45 | 93.93 | 103.47 | 13.82 | 14.23 | 14.27 | -.39 | -.46 | -.48 | .26 | .13 | -.39 |
| ELEC[b] | 181.42 | 192.37 | 209.91 | 24.01 | 26.24 | 27.43 | .21 | -.12 | -.59 | .53 | .39 | -.07 |
| AFQT[a] | 64.30 | 68.63 | 78.25 | 15.17 | 15.38 | 15.23 | -.28 | -.27 | .08 | .03 | -.08 | -.53 |

[a] Raw scores.

[b] Standard scores.

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